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NATIONAL DAM SAFETY PROGRAM. BEAR POND DAM (NJ00773), DELAWARE --ETC(U)
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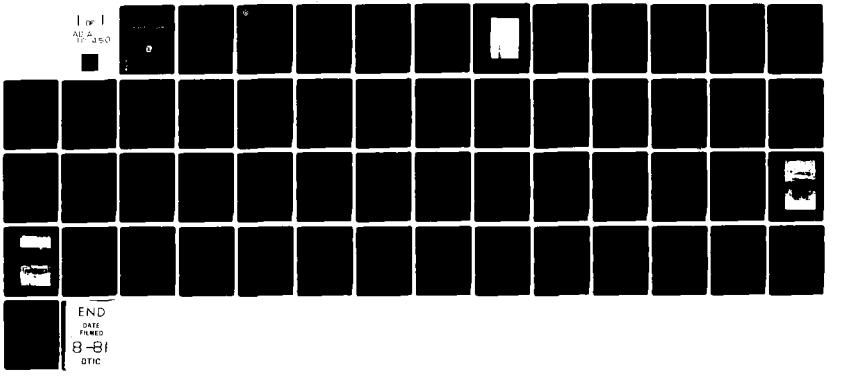

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DELAWARE RIVER BASIN,
COLD BROOK, SUSSEX COUNTY,
NEW JERSEY

LEVEL II

BEAR POND DAM
NJ00773

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

REPT. NO: DAEN/NAP-53842/NJ00773-81/07

JULY 1981

National Dam Safety Program. Bear Pond Dam (NJ00773), Delaware River Basin, Cold Brook, Sussex County, New Jersey. Phase I Inspection Report.

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Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Embankments
Visual Inspection
Structural Analysis
National Dam Safety Program
Bear Pond Dam, New Jersey
Spillways

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

30 JUN 1981

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Bear Pond, Sussex County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Bear Pond Dam, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. To ensure the adequacy of the structure the following remedial actions are recommended:

a. The following actions should be completed within one year from the date of approval of this report:

(1) The three-inch pipe outlet should be located to determine if it is the source of the seepage at the toe of the dam. If such a correlation cannot be obtained, the seepage should be monitored and corrective action taken if the volume of flow increases or the movement of fine material is noted in the discharge.

(2) The heavy brush and other vegetation should be cleared from the spillway and the dam.

(3) Bare patches of the embankment should be reseeded and a firm grass cover established.

(4) The deteriorated concrete at the spillway should be repaired and the weir brought up to the original grade.

NAPEN-N
Honorable Brendan T. Byrne

(5) When located, the outlet pipe should be cleaned out in order to maintain stream flow below the dam when the lake level drops below the spillway crest.

(6) Additional drawdown facilities should be installed at the dam.

b. The owners should develop written operating procedures and a maintenance plan whereby the dam and spillway may receive periodic remedial work to avoid the extensive deterioration noted at the spillway facility. This should be initiated within one year from the date of approval of this report.

c. It is further recommended that the dam be monitored periodically and a downstream warning system and emergency action plan be developed within six months from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

Kenneth R Moser Maj CE DDE
for JAMES G. TON
Colonel, Corps of Engineers
Commander and District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

BEAR POND DAM (NJ00773)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 4 February 1981 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Bear Pond Dam, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. To ensure the adequacy of the structure the following remedial actions are recommended:

a. The following actions should be completed within one year from the date of approval of this report:

(1) The three-inch pipe outlet should be located to determine if it is the source of the seepage at the toe of the dam. If such a correlation cannot be obtained, the seepage should be monitored and corrective action taken if the volume of flow increases or the movement of fine material is noted in the discharge.

(2) The heavy brush and other vegetation should be cleared from the spillway and the dam.

(3) Bare patches of the embankment should be reseeded and a firm grass cover established.

(4) The deteriorated concrete at the spillway should be repaired and the weir brought up to the original grade.

(5) When located, the outlet pipe should be cleaned out in order to maintain stream flow below the dam when the lake level drops below the spillway crest.

(6) Additional drawdown facilities should be installed at the dam.

b. The owners should develop written operating procedures and a maintenance plan whereby the dam and spillway may receive periodic remedial work to avoid the extensive deterioration noted at the spillway facility. This should be initiated within one year from the date of approval of this report.

c. It is further recommended that the dam be monitored periodically and a downstream warning system and emergency action plan be developed within six months from the date of approval of this report.

APPROVED: Kenneth R Moser, Maj CE DDE
for JAMES G. TON
Colonel, Corps of Engineers
Commander and District Engineer

DATE: 30 June 1981

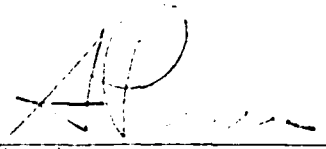
PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam Bear Pond Dam Fed ID# NJ 00773

State Located	New Jersey
County Located	Sussex
Coordinates	Lat. 4058.0 - Long. 7439.9
Stream	Unnamed Tributary to Lubber's Run
Date of Inspection	February 4, 1981

ASSESSMENT OF GENERAL CONDITIONS

Bear Pond Dam is considered to be in good structural condition although the concrete spillway is in an advanced state of deterioration. The spillway capacity is adequate since it is capable of accommodating the 100-year design flood and it is recommended that the classification of the dam be downgraded to the significant hazard category. No additional studies are believed necessary although remedial actions the owner should undertake in the future include determining the source of, and monitoring, the seepage at the toe of the dam; removal of heavy brush and other vegetation from the embankment and spillway; reseeding of bare embankment areas; repair of concrete at the spillway and reestablishment of the original weir elevation; clearing or replacement of the 3-inch-diameter outlet pipe; and the installation of drawdown facilities at the dam. It is further recommended that the owner establish a system of periodic maintenance, a downstream warning system and an emergency action plan.



Abraham Perera P.E.
Project Manager

OVERVIEW OF BEAR POND DAM
FEBRUARY, 1981

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines can be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I investigations is to identify expeditiously those dams that may pose hazards to human life or property. The assessment of the general condition of the dam is based on available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In the review of this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway test flood is based on the estimated "probable maximum flood" for the region (greatest reasonable possible storm runoff) or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: BEAR POND DAM FED #NJ 00773 AND NJ ID# 22-77

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Engineer District, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Bear Pond Dam and appurtenant structures and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The dam at Bear Pond consists of two individual structures separated by about 200 feet of bedrock. The northernmost structure is a 100-foot-long, 15.5-foot-high earthen dike built across a depression in the bedrock. The spillway structure is situated about 200 feet to the south of the dike and consists of an earth dam with a trapezoidal-shaped, reinforced concrete weir at its right (north) abutment. Available information indicates this structure is a total of 260 feet long and 5 feet high, but the length could not be verified in the field because the earth portion blends completely into the surrounding terrain and no distinct dam shape was apparent except in the vicinity of the spillway weir. The weir has a bottom width of 48 feet, 2H:1V concrete and masonry sidewalls, and a relatively flat (5% grade) spillway apron. The apron grades into the steeper bedrock channel about 13 feet downstream from the 18-inch-wide weir sill.

The embankment of the northerly dam has 1.5H:1V side slopes (riprapped on the upstream face) and a crest width that ranges from 15 feet near the center of the dam to 20 feet at the left abutment and 50 feet at the right abutment. A 2-inch-diameter PVC siphon lies across the crest and down the back side of this dam. A 3-inch-diameter water supply outlet pipe is located 3 feet below the spillway crest.

b. Location

The dam is located in the headwaters of a small unnamed tributary to Lubber's Run in Hopatcong Township, Sussex County, New Jersey. It is approximately 0.5 mile ENE of the intersection of Maxim Drive and the Sparta-Stanhope Road.

The only access through the woods to the dam is via a 2,000 foot long footpath that starts at the end of a private driveway. The driveway extends 700 feet in an easterly direction from a point on Maxim Drive to a cluster of homes near the lake's edge. The entrance to the driveway is located approximately 2,200 feet east of the intersection of Maxim Drive and the Sparta-Stanhope Road.

c. Size Classification

The dam at Bear Pond has a maximum height of 15.5 feet and a maximum storage capacity of 557 acre-feet. Accordingly, this dam is in the small size category as defined by the criteria in the Recommended Guidelines for Safety Inspection of Dams (storage less than 1,000 acre-feet and height less than 40 feet).

d. Hazard Classification

The dam is located in a rural portion of the county. Although there are several dozen homes on the east and south shore of the lake, the area downstream of the dam as far as Lubber's Run is uninhabited with the exception of the Hudson Guild Farm. The Guild is a non-profit organization providing recreational facilities to underprivileged children and senior citizens. During the summer months, there may be as many as 100 people in residence on the property. The nearest structure is situated well above the flood plain about 1,700 feet downstream of the dam near a 5-acre swimming pond. Inspection of the downstream valley and area surrounding the pond reveals that the

winding steep-sided channel widens to about 200 feet approximately 550 feet below the dam. It is believed that much of a flood's energy would be absorbed in this area while the broad, deep valley in the vicinity of the Guild's farm would be able to dissipate the remainder of a failure-induced flood with only minor damage to the pond. Communication with the owners of the Hudson Guild Farm, Mr. & Mrs. Curtis Ream, indicates that there has never been any damage from flood runoff, including hurricanes, for the 35 years they have lived on the property. However, since there is a potential for personal injury and possibly the loss of a few lives if bathers were using the pond during a dam failure, it is recommended that this dam be evaluated within the framework of the significant hazard classification.

e. Ownership

This dam is owned by the Hudson Guild Farm, which is located on the Sparta-Stanhope Road in Hopatcong Township. The mailing address is R.D.2, Andover, New Jerey 07821.

f. Purpose of Dam

The purpose of the dam is recreation.

g. Design and Construction History

Little is known concerning the history of the dam except that it was rebuilt by the Morris Canal and Banking Company in 1928. The addition of a siphon to dewater the pond was first implemented in 1947 by the Bear Pond property owners' association.

h. Normal Operating Procedures

There are no operating procedures in effect at the dam although every few years the home owners' association uses the siphon to lower the lake level for dock repairs.

1.3 PERTINENT DATA

a. Drainage Area

Bear Pond Dam has a drainage area of 0.58 square miles, which consists primarily of sparsely inhabited woodland and marshes.

b. Total spillway capacity at maximum pool elevation - 342 cfs

c. Elevations (NGVD Datum Estimated)

Top of dam	- 977.0
Principal spillway crest	- 975.3
Outlet pipe	- 972.0
Streambed at centerline of dam	- 961.5

d. Reservoir

Length of maximum pool (top of dam) - 3,665 feet

Length of recreation pool (spillway crest) - 3,475 feet

e. Storage (acre-feet)

Top of dam	- 557
Recreational pool	- 440

f. Reservoir Surface (acres)

Top of dam	- 75.5
Recreation pool	- 62

g. Dam

Type - earth with concrete spillway located 200 feet south of the dam

Length - 100 feet with a 48- to 56-foot-long spillway section

Height - Main earth dam: - 15.5 feet
Spillway earth component: - 5 feet

Top width - variable: 15 to 50 foot crest width

Side slopes - 1.5H:1V

Zoning - unknown

Impervious blanket - unknown

Cutoff - unknown

Grout curtain - unknown

h. Diversion and Regulating Tunnel

Type - none

i. Spillway

Type - concrete trapezoidal-shaped weir located 200 feet south of the dam

Channel width - 48-56 feet

Gates - none

U/S channel - Bear Pond

D/S channel - steep (10%) bedrock channel

j. Regulating Outlets

A 3-inch-diameter outlet pipe is reportedly located 3 feet below the spillway crest. A 2-inch-diameter PVC siphon is located at the main dam and may be adjusted to various intake depths within the lake.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Information pertaining to the design of the dam was not available for review. The only source of technical data pertaining to the dam was a 1929 Dam Reference Data card, which provided information relevant to the geometry and dimensions of the structure. The Geologic Map of New Jersey depicts Bear Pond in its present configuration, indicating that the original design and construction took place some time prior to 1910-1912.

2.2 CONSTRUCTION

Information pertaining to the construction of the dam was not available. However, field measurements and a geotechnical review provided sufficient data to assess the hydraulic capacity of the spillway and the foundation conditions. The dam is located in a region underlain by the Byram Gneiss, a hard, durable, Precambrian metamorphic rock that is excellent as a foundation material. The overburden is generally shallow, consisting of ground moraine derived from gneiss and occurring in pockets in the bedrock. The entire rim of Bear Pond consists of rugged, irregular cliffs of gneiss outcrops.

2.3 OPERATION

There are no regulatory components at the dam and information pertaining to any type of operation was not available. However, the presence of the PVC siphon suggests that the lake is still drawn down periodically as originally implemented in 1947.

2.4 EVALUATION

a. Availability

While the original design and construction data are not available, the field reconnaissance produced sufficient information to enable the inspection team to complete its evaluation.

b. Adequacy

In view of the hazard classification and present condition of the dam the information obtained is believed to be adequate to perform the following assessment.

c. Validity

The lake was planimetered and found to have a surface area of 62 acres rather than 38 acres, as indicated on the 1929 Dam Reference Data card.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Due to its low height and the fact that the earth portion of the spillway structure has been completely absorbed by the surrounding terrain and was not discernable as a component of the dam, the inspection of the facilities at Bear Pond focused on the 15.5-foot-high earth dam and the concrete spillway 200 feet to its south.

Visual inspection of Bear Pond Dam took place on February 4, 1981. The dam and spillway structure both appeared to be in a very neglected, although structurally stable, condition. The lake was completely frozen over to a depth of 20 inches but an inch of water was still flowing over the spillway at the time of the inspection.

b. Dam

This earth dam lies across a saddle in the bedrock on the northwest rim of the lake. Although maintenance has apparently been neglected for a great many years, the dam appears quite sound, structurally, and in fair condition. The crest is uniform in a horizontal plane although its width varies from 20 to 50 feet at the abutments. The downstream slope is relatively steep with little grass cover, but no signs of slumping, settlement, or erosion were noted. A great many trees are growing along the edges of the crest and on the downstream slope. The dam grades smoothly into the abutments making it difficult to determine where the embankment begins and ends. Light seepage was observed at the center of the dam's downstream toe. About 100 feet further downstream the seepage and ground water from the steep side walls of the valley form a small stream that joins the main channel 550 feet downstream of the spillway. The seepage contains a heavy iron precipitate, suggesting that it may be coming from the 3-inch-diameter outlet pipe, which was not located and whose exit is believed buried and overgrown by 50 years of inattention. The pipe has probably corroded closed, reducing flow to an orange-colored, iron-rich seep.

c. Appurtenant Structures

The spillway weir is in very poor condition although of little concern with respect to its hazard potential. The sill of the 18-inch-wide weir is so badly eroded that the horizontal rebar is exposed and the edges are completely rounded. The apron is severely deteriorated and bedrock is exposed over much of its area. Only the center of the weir effectively transmits water at low flows (4 inches and less over the weir).

Vegetation, including trees up to 9 inches in diameter, have established themselves in the silt-filled cracks over much of the spillway apron, which concentrates low flows in the central 15 to 20 feet of the weir. The sloping side walls and abutment piers of the spillway are in fair condition and would channelize high flows if necessary. The spillway reportedly leaks at low flow, but this was not observed because the spillway was obscured by discharge during the inspection. The 3-inch-diameter outlet pipe believed to be situated at the earth dam was not located.

d. Reservoir Area

The drainage area of this impoundment is quite small and only sparsely inhabited; it consists primarily of woodland and mountain-top marshes. The lake is rimmed by bedrock exposures with steep cliffs rising abruptly from the lake. Considerable sedimentation has occurred in the vicinity of the spillway where the level of the deposition is now within one foot of the crest. However, increased loading, due to deposition, poses no threat to that structure since the spillway is, essentially, a pavement veneer over the bedrock which lies within a foot of the weir crest elevation.

e. Downstream Channel

The channels from the spillway and earthen dam to the north converge about 550 feet downstream from the lake's rim. The narrow, steep-sided channels widen to about 200 feet at their confluence before winding their way to the large, flatter valley containing Lubber's Run. Both channels are heavily forested with bedrock at, or very close to, the surface of the boulder-ladden streams.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no operational components at the dam or spillway. Conversation with a local resident indicates the dam has functioned unattended for several years. While the siphon at the dam is apparently used to lower the lake level, there is no indication to what extent, or when, the lake was last drawn down.

4.2 MAINTENANCE OF DAM

There does not appear to have been any maintenance performed at the dam in a number of years. Communication with representatives of the owner indicates there are no specific maintenance procedures in force at the present time.

4.3 MAINTENANCE OF OPERATING FACILITIES

There are no operating facilities, per se, at the dam or spillway.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

No warning system or formal monitoring system exists at the dam.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

Because the dam is essentially self-regulated with no operable components, formal operational procedures are felt to be superfluous. However, periodic maintenance and monitoring are considered to be deficient. While the design configuration inherently provides controlled flood water release without attendant operational personnel, periodic checks and inspection are deemed to be essential to assure continued safe performance.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Pursuant to the Recommended Guidelines for Safety Inspection of Dams, Bear Pond Dam is a small size and significant hazard. Accordingly the 100-year frequency storm was chosen as the design flood by the inspecting engineers. Inflow to the reservoir for the selected storm was computed utilizing precipitation data from Technical Paper 40 and Technical Memorandum NWS HYDRO-35, by the HEC-1 computer program, which gave a peak inflow of 1,273 cfs. Routing this storm through the reservoir reduced the peak discharge to 256 cfs. As the spillway capacity is 342 cfs, it can safely accommodate more than the 100-year storm and is therefore adequate.

b. Experience Data

There are no streamflow records available for this site, nor have records been kept regarding the dam's hydraulic performance since its construction.

c. Visual Observations

There is no evidence of recent problems. The lake level was at normal pool elevation at the time of inspection.

d. Overtopping Potential

Employing the discharge and spillway capacities contained herein, overtopping would not occur in the event of the 100-year frequency storm. There are no records or indications that the dam has ever been overtopped.

e. Drawdown

For all practical purposes, there is no facility for drawdown. There is, however, a 2-inch PVC pipe available on the site for the purpose of drawing water from Bear Pond to augment flows to downstream sites during dry periods. If the 2-inch PVC were used for drawdown, it would take 541 days to draw down to elevation 962, assuming that there is no inflow to Bear Pond. Therefore, the owners should consider installing additional drawdown facilities at the dam.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

No deficiencies of a structural nature were noted during the inspection of the dam embankment. The horizontal alignment of the dam crest is good and the downstream slope is very uniform and stable. No indication of material movement such as settling, sloughing, or creeping was observed. The spatial relationship between the spillway weir and the dam crest is as indicated on the 1929 Dam Reference Data card and, although the structure is in poor condition, the spillway's continued stability is not considered to be a matter for concern since the structure is so low and bedrock is so high everywhere in its vicinity.

b. Design and Construction

There are no design or construction data available for review, but field measurements indicate the dam was designed conservatively and well constructed. Although the dam was rebuilt over 50 years ago, the spillway capacity is still adequate, being able to satisfy the more stringent, present day standards. While the slopes of the embankment are relatively steep by contemporary standards, it is apparently quite stable and uniform although completely unattended for several decades.

c. Operating Records

There are no operations at this dam although it has apparently performed satisfactorily since its construction.

d. Post Construction Changes

There are no records or indications that the dam has been modified in any way since its construction.

e. Seismic Stability

Bear Pond Dam is located in Seismic Zone 1 in which seismic activity is slight and additional structural loading imparted thereby is generally

insignificant. Experience indicates that earthen dams in Zone 1 that are stable under static loading conditions will maintain their structural integrity when subjected to the negligible dynamic loads imposed by the weak seismicity characteristic of this area. This dam is considered to be structurally stable under static loading conditions.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/ REMEDIAL ACTIONS

7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the Phase I visual inspection, the dam at Bear Pond is considered to be in good structural condition, although the overall condition of the spillway weir and apron is poor. The spillway capacity is adequate to accommodate the 100-year frequency flood so overtopping of the embankment portion of the dam is a remote possibility. Since there is a potential for personal injury at a recreational pond downstream, it is recommended that the dam be evaluated within the framework of the significant hazard classification.

b. Adequacy of Information

Although no records were located, the field information gathered for the Phase I inspection is deemed to be adequate regarding the continued safe operation and structural stability of the dam. It is believed that little other engineering information is available.

c. Urgency

The remedial work described herein should be undertaken in the future.

d. Necessity for Further Study

Additional H&H investigations are believed to be unnecessary because the dam has adequate spillway capacity to accommodate the design flood.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Recommendations

It is recommended that the owner undertake the following work to ensure the continued functioning of the dam and impoundment:

1. The three-inch pipe outlet should be located to determine if it is the source of the seepage at

the toe of the dam. If such a correlation cannot be obtained, the seepage should be monitored and corrective action taken if the volume of flow increases or the movement of fine material is noted in the discharge.

2. The heavy brush and other vegetation should be cleared from the spillway and the dam.

3. Bare patches on the embankment should be reseeded and a firm grass cover established.

4. The deteriorated concrete at the spillway should be repaired and the weir brought up to the original grade.

5. When located, the outlet pipe should be cleaned out in order to maintain stream flow below the dam when the lake level drops below the spillway crest.

6. Additional drawdown facilities should be installed at the dam.

b. O&M Procedures

It is recommended that the owners develop a maintenance plan whereby the dam and spillway may receive periodic remedial work to avoid the extensive deterioration noted at the spillway facility. It is further recommended that the dam be monitored periodically and a downstream warning system and emergency action plan be developed.

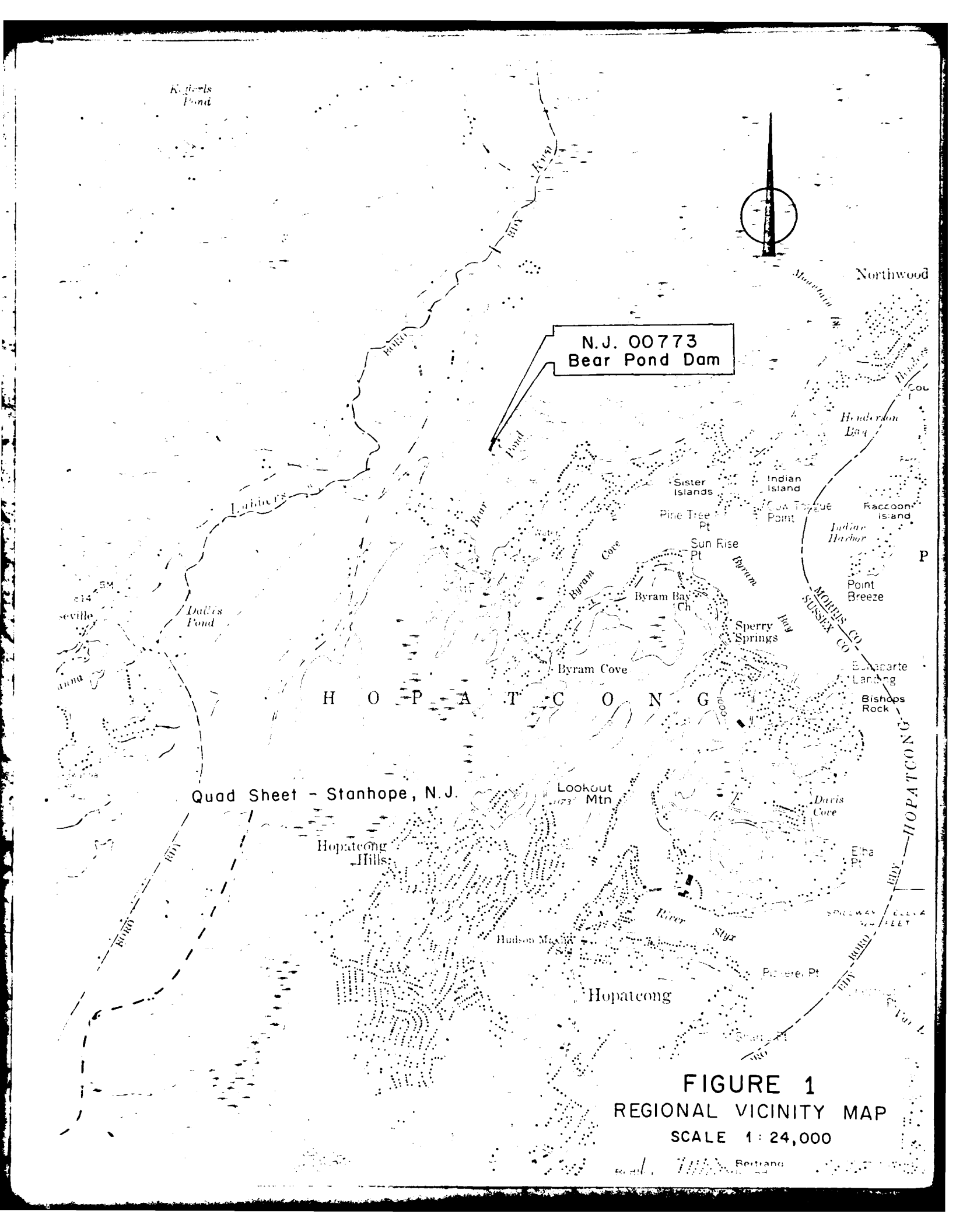
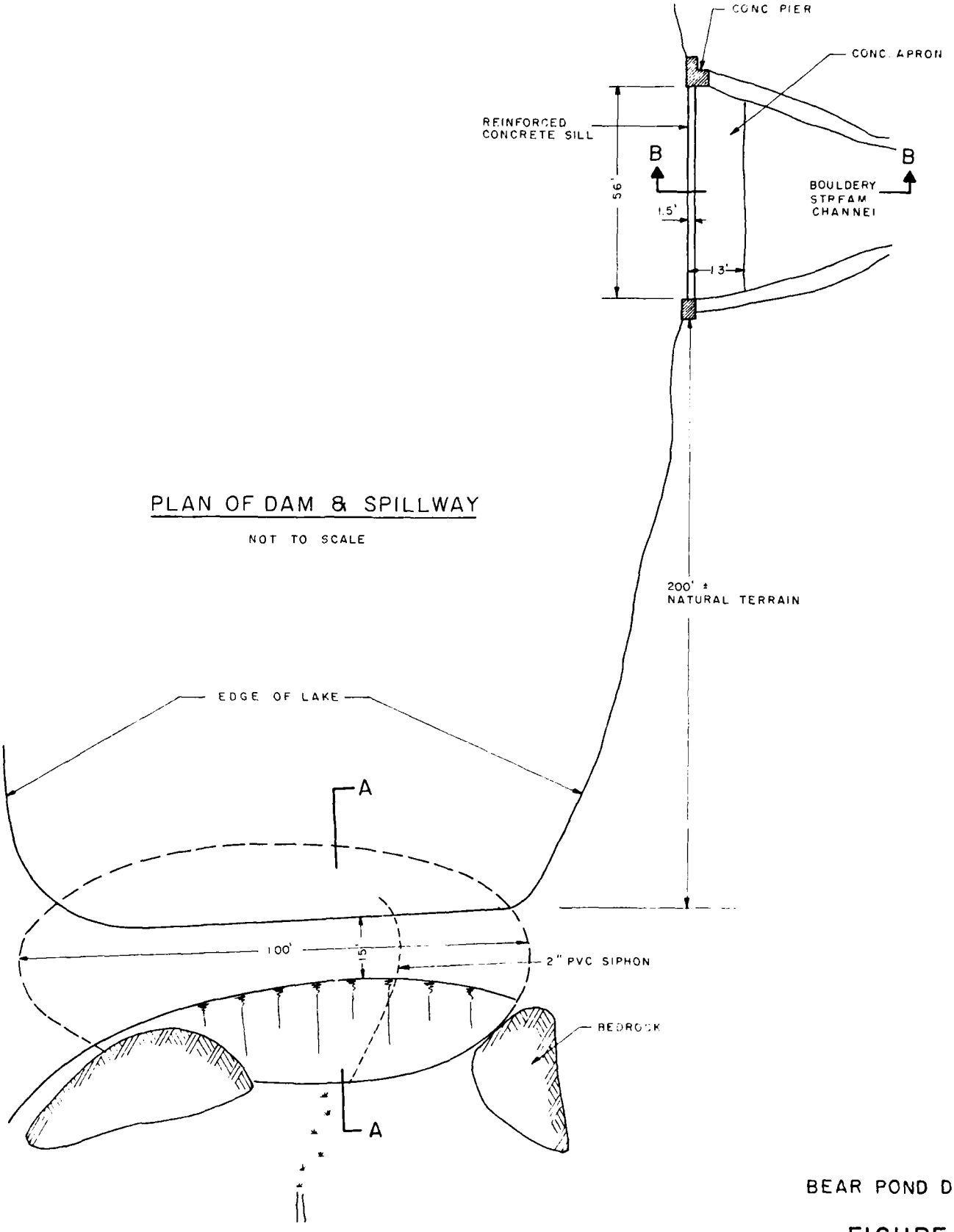
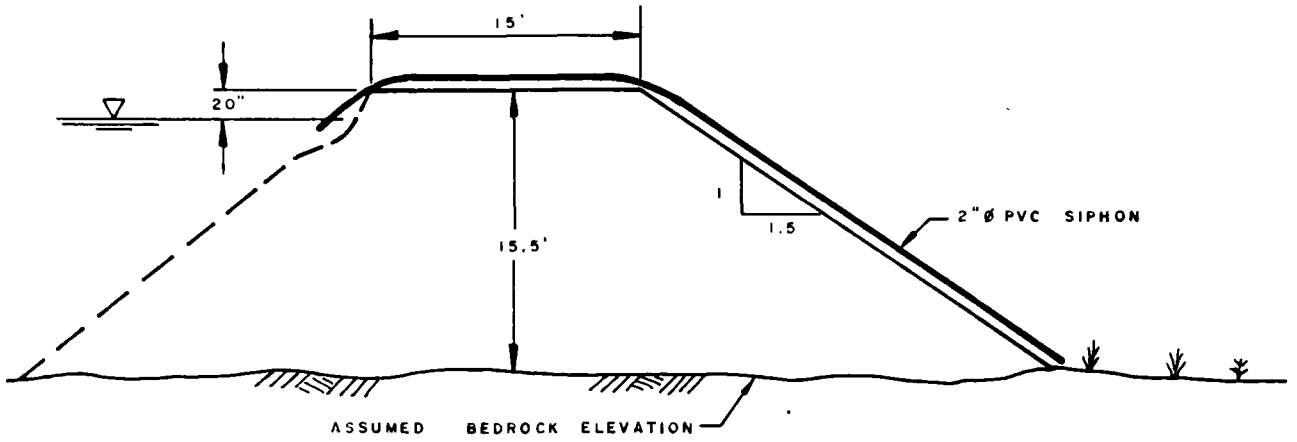


FIGURE 1
REGIONAL VICINITY MAP
SCALE 1 : 24,000



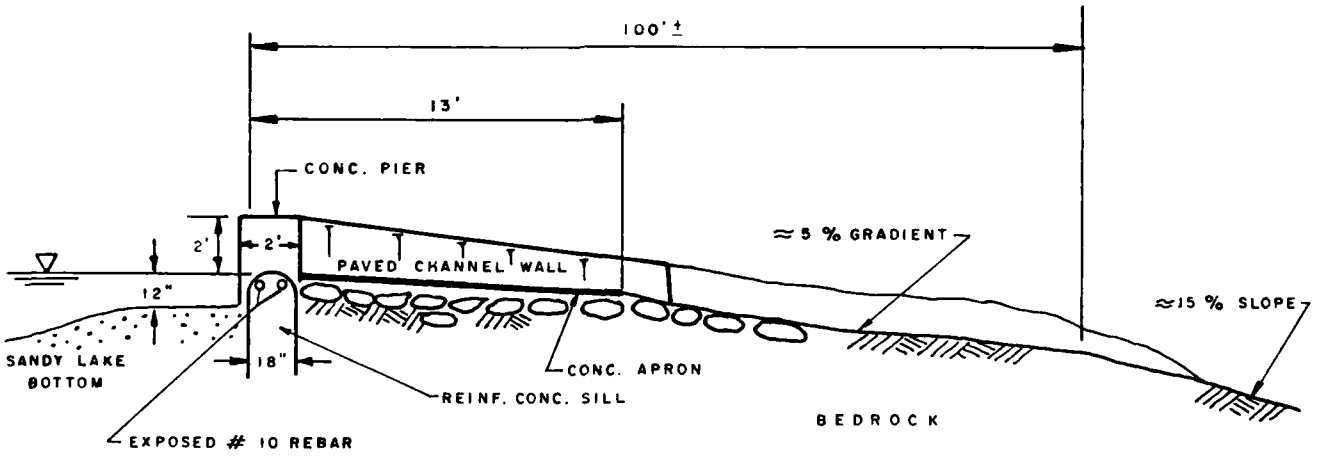
BEAR POND DAM

FIGURE 2



TYPICAL DAM SECTION A–A

NOT TO SCALE



SPILLWAY SECTION B–B

NOT TO SCALE

FIGURE 3

Check List
Visual Inspection
Phase 1

Name Dam Bear Pond Dam County Sussex State New Jersey Coordinators NJDEP

Date(s) Inspection 2/4/81 Weather Overcast Temperature 15°F

Pool Elevation at Time of Inspection 98 A.D.* Tailwater at Time of Inspection 82 A.D.*

Inspection Personnel:

T. Chapter J. Ceravalo

A. Perera

J. Greenstein

No representative of owner present

T. Chapter Recorder

* A.D. - Assumed Datum

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Possibly light erosion on downstream slope.	Several parts of slope are devoid of vegetation, but no erosion gullies were noted. Embankment appears very firm and stable.
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Satisfactory.	
RIPRAP FAILURES	None observed.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Trees growing along both upstream and downstream slopes. Some patches on downstream slope devoid of any vegetation.	Trees should be removed and grass introduced to bare patches.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Satisfactory. Embankment grades smoothly into bedrock abutments.	
ANY NOTICEABLE SEEPAGE	Seepage originating at toe of dam becomes a small stream about 100' downstream of dam.	Presence of heavy, orange, iron precipitate indicates the seepage passing through either iron-rich bedrock or a steel pipe. Seepage should be monitored, although flows are probably due to an old water pipe.
STAFF GAGE AND RECORDER	None.	
DRAINS	None.	A 2 inch-diameter PVC siphon is apparently used to lower the lake occasionally.

OUTLET WORKS NOT APPLICABLE

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT		
INTAKE STRUCTURE		
OUTLET STRUCTURE		
OUTLET CHANNEL		
EMERGENCY GATE		

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	50' long reinforced concrete weir in poor condition. Badly eroded and re-bar exposed. Spillway discharges over long, sloping concrete apron which grades into bedrock bottom of channel about 13' downstream.	Spans saddle in bedrock about 200' south of main dam. Sill of weir is 18" wide. Eroded concrete should be repaired. Spillway apron is badly spalled and may be leaking and also requires remedial work.
APPROACH CHANNEL	None.	
DISCHARGE CHANNEL	Spillway discharges down a long, 5% sloping, trapezoidal concrete channel. Concrete is in poor condition everywhere except channel sides.	Although slab apparently rests on bedrock, concrete is deteriorating rapidly and should be cleaned up and repaired.
BRIDGE AND PIERS	None.	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Very steep, heavily wooded slopes with scattered homes on only one side of lake.	Drainage area is essentially undeveloped.
SEDIMENTATION	Ice precluded close examination of upstream face of earth dam. However, the area directly in front of the spillway, located 200' to the south, is only 1' deep. Lake bottom consists of coarse sand and gravel at this location.	Bedrock at the location of the spillway appears slightly higher than siltation level.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Natural forested channel with some scattered boulders. Channel from earth dam meets spillway channel about 500' downstream in a 200' wide valley.	Not a significant constraint to discharge.
SLOPES	Side slopes rather steep at 2:1 to 3:1. Channel gradient ranges from 5% at spillway apron to 15% 100'-500' downstream before flattening in the Lubber's Run Valley.	
APPROXIMATE NO. OF HOMES AND POPULATION	Hudson Guild Farm about 1700' downstream. Several bungaloes and main house. Population varies from a caretaker staff in winter to between 50 and 100 persons during the summer months.	Hudson Guild provides recreational facilities for underprivileged children and senior citizens during the summer months. Facilities are situated above the stream's flood plain.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Not Available.
REGIONAL VICINITY MAP	USGS Stanhope, N.J. Quadrangle.
CONSTRUCTION HISTORY	Not Available.
TYPICAL SECTIONS OF DAM	Not Available.
HYDROLOGIC/HYDRAULIC DATA	Not Available.
OUTLETS - PLAN	Not Available.
- DETAILS	
-CONSTRAINTS -DISCHARGE RATINGS	
RAINFALL/RESERVOIR RECORDS	Not Available.

ITEM	REMARKS
SPILLWAY PLAN	Not Available.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Not Available.

ITEM	REMARKS
DESIGN REPORTS	Not Available.
GEOLOGY REPORTS	Not Available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not Available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not Available.
POST-CONSTRUCTION SURVEYS OF DAM	Not Available.
BORROW SOURCES.	Not Available.

ITEM	REMARKS
MONITORING SYSTEMS	None Available.
MODIFICATIONS	None Available.
HIGH POOL RECORDS	None Available.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None Available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None Available.
MAINTENANCE OPERATION RECORDS	None Available.

February, 1981

View of Dam Crest

February, 1981

View of Downstream Slope of Dam

February, 1981

View of Spillway Looking Downstream

February, 1981

View of Spillway Looking Upstream

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.58 sq. mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 975.3 NGVD (440 ac. ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N/A

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 977 NGVD (557 ac.ft.)

CREST: Spillway

a. Elevation 975.3 NGVD
b. Type Ungated, broad crested, trapezoidal-shaped weir
c. Width 48 to 56 feet
d. Length 14.5 feet
e. Location Spillover 200 feet south of earth dam
f. Number and Type of Gates None

OUTLET WORKS:

a. Type Ungated drain
b. Location Center of earth dam
c. Entrance inverts 972
d. Exit inverts Unknown
e. Emergency draindown facilities None

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 342 cfs

BY [illegible] DATE [illegible]

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. [illegible] OF [illegible]

CHKD. BY ______ DATE ______ [illegible], N.J. PROJECT [illegible]

SUBJECT [illegible]

Drainage Area = .60 sq. mi. [illegible] N.J.

[illegible] 1 [illegible] along watercourse = 3500' = .663 mi.

L_H = [illegible] = 77 ft. ∴ Slope = $\frac{77'}{3500}$ = .022 = 2.2%

From Design of Small Dams Fig. [illegible]

Assume Channel velocity of 3 [illegible] ∴ t_c = 19 min = .33 Hr.

Length overland flow = 600'

L_H = 1115 - 1055 = 40; Slope = [illegible] = .05 = 5%

From Design of Small Dams Fig. [illegible]

Assume overland velocity of 1.5 [illegible] ∴ t_c = 8.9 min = .15 Hr.

Total t_c = .33 + .15 = .48 Hrs.

Method 2 [illegible] Culvert methodology

[illegible] $t_c = \left(\frac{11.9 \times L^3}{H}\right)^{.385} = \left(\frac{11.9 \times .663^3}{77}\right)^{.385}$ = .3 [illegible]

Overland t_c = .11 Hr.

Total t_c = .3[illegible] + .15 = .45 Hr.

Method 3 SCS methodology

[illegible] Group B	CN
8% [illegible] residential	70
7[illegible] [illegible]	65
[illegible] [illegible]	55
Weighted CN	57

[illegible] Y = 4.2 [illegible]

S = $\frac{1000}{CN}$ - 10 = 7.5

L = [illegible] = 4200'

L = [illegible] = [illegible] = .2[illegible] hours

[illegible] = [illegible] = .5[illegible] [illegible]

[illegible] T_c = [illegible] = .5[illegible] Hours

[illegible] = .6 × .8[illegible] = [illegible] [illegible] Unit HYD.

BY [illegible] DATE 3/1/84 | **LOUIS BERGER & ASSOCIATES INC.** | SHEET NO. A-5 OF ---

CHKD. BY ---- DATE ---- | Beam Pond Dam | PROJECT 82-276

SUBJECT Test Storm: 100 Year Freq.

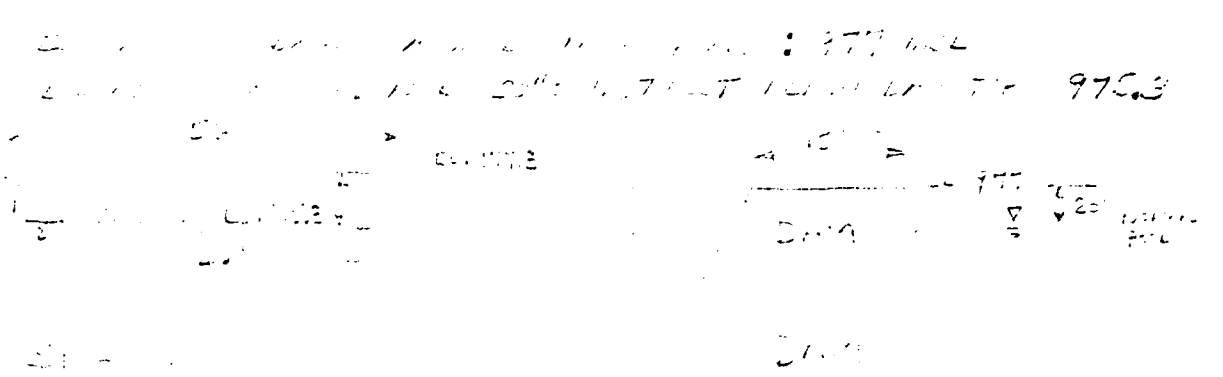
Precipitation data from TP-40 & NOAA Technical Memorandum NWS Hydro-35

Time	Precip.	Δ	RΔ	Time	Precip.	Δ	RΔ
0.1	.91	.91	.03	3.1	4.30	.05	.91
0.2	1.46	.55	.03	3.2	4.34	.04	.35
0.3	1.81	.35	.03	3.3	4.38	.04	.23
0.4	2.07	.26	.03	3.4	4.41	.03	.17
0.5	2.30	.23	.02	3.5	4.45	.04	.12
0.6	2.46	.16	.03	3.6	4.48	.03	.10
0.7	2.63	.17	.02	3.7	4.52	.04	.09
0.8	2.77	.14	.04	3.8	4.56	.04	.08
0.9	2.89	.12	.03	3.9	4.60	.04	.07
1.0	3.00	.11	.03	4.0	4.63	.03	.06
1.1	3.10	.10	.03	4.1	4.66	.03	.06
1.2	3.20	.10	.04	4.2	4.69	.03	.05
1.3	3.29	.09	.03	4.3	4.72	.03	.05
1.4	3.36	.07	.03	4.4	4.75	.03	.05
1.5	3.44	.08	.04	4.5	4.78	.03	.04
1.6	3.51	.07	.04	4.6	4.82	.04	.05
1.7	3.58	.07	.05	4.7	4.85	.03	.04
1.8	3.65	.07	.05	4.8	4.87	.02	.04
1.9	3.71	.06	.05	4.9	4.90	.03	.04
2.0	3.76	.05	.05	5.0	4.93	.03	.04
2.1	3.82	.06	.05	5.1	4.96	.03	.03
2.2	3.87	.05	.07	5.2	4.98	.02	.03
2.3	3.92	.05	.07	5.3	5.01	.03	.03
2.4	3.97	.05	.07	5.4	5.04	.03	.03
2.5	4.02	.05	.10	5.5	5.06	.02	.03
2.6	4.07	.05	.11	5.6	5.09	.03	.03
2.7	4.12	.05	.14	5.7	5.12	.03	.03
2.8	4.17	.05	.16	5.8	5.15	.03	.02
2.9	4.21	.04	.26	5.9	5.17	.02	.03
3.0	4.25	.04	.55	6.0	5.20	.03	.02

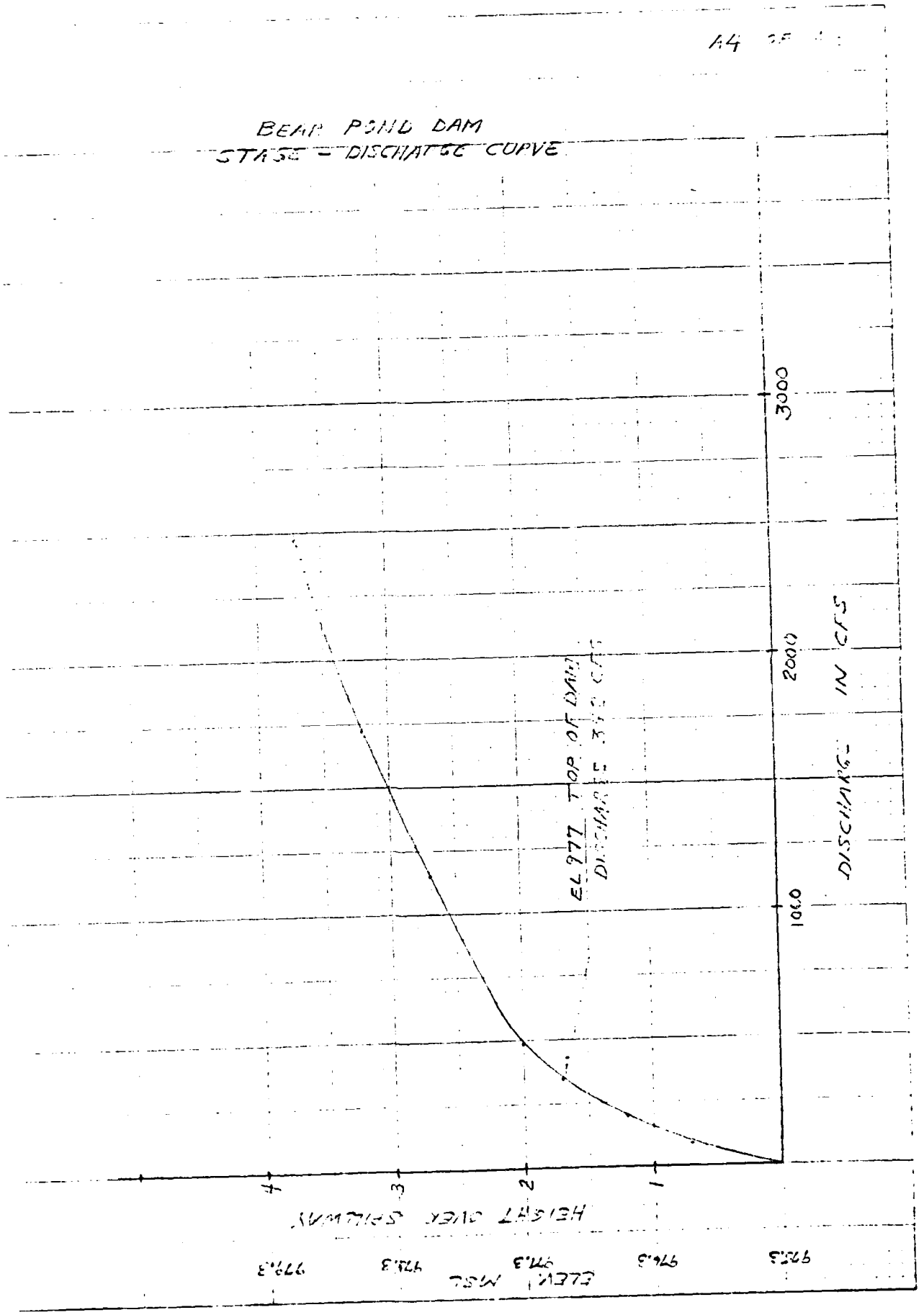
BY _____ DATE _____
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. _____ OF _____
PROJECT _____



BEAR POND DAM
STAGE - DISCHARGE CURVE



BY _____ DATE _____

CHKD. BY _____ DATE _____

SUBJECT _____

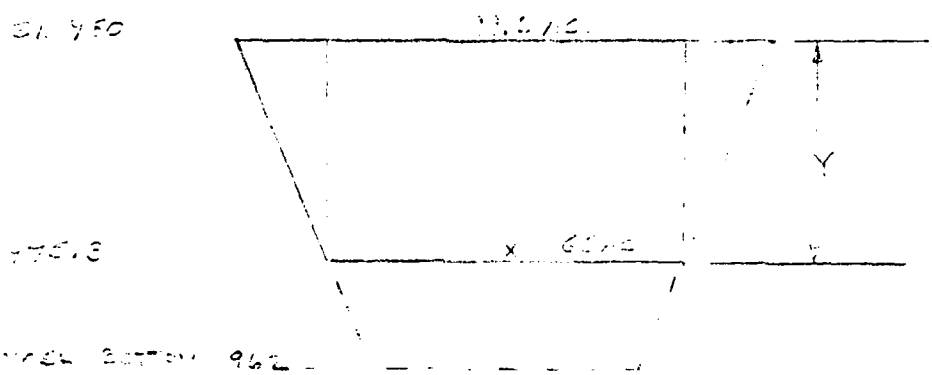
LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A5 OF _____

PROJECT _____

AREA OF LAKE AT ELEV. 775.3 = 68 ACRES (Silty Lake)

AREA AT ELEV. 780.0 = 99 ACRES



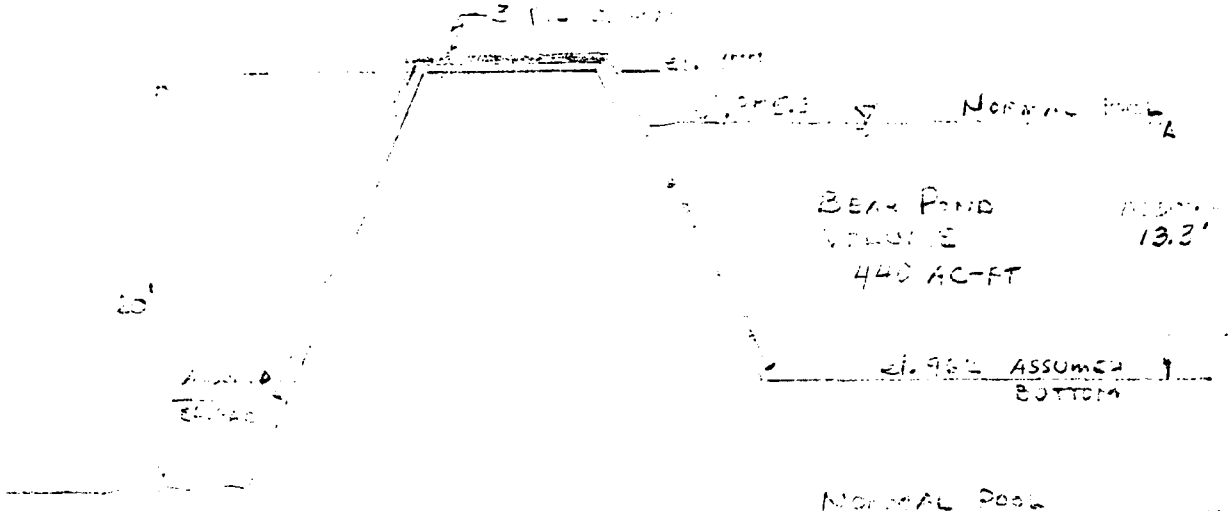
APPROX. BOTTOM WIDTH

ELEV. (M.S.L.)	HT. above Spillway (Ft.)	Surface Volume Ac. Ft.	Area of Surface Storage (Acres)	
775.3	0	0	68	To Spillway Crest
[illegible]	1.7	116.5	75.5	Top of Dam
[illegible]	3.7	375.5	[illegible]	

BY _____ DATE _____ **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 14 OF _____

CHKD. BY _____ DATE _____ Elm Pond Dam PROJECT C-2716

SUBJECT Dam Breach Analysis



Normal Pool Impounding Capacity 440 AC-FT

Ht Max = 15.3

Area of Pipe = .05 Sq. Ft.

Length of Pipe = 50'

Ho max = 15.3 - 1/2 (.5) = 15.0'

Pipe Losses

1) Entrance (Ke) = .1
2) Bends (2) (Kb) = .4
3) Exit (Kex) = 1.0
4) Friction Loss $\frac{\epsilon}{D} = .005 \frac{22}{125} = 3.0$

PVC. $\epsilon = .0001'$

$\frac{\epsilon}{D} = \frac{.0001'}{.125} = .0006$

$\therefore f = .015$

Total Losses = 4.5

Design of Small Dams
Chapter 10

$Q = C_d A \sqrt{2gH}$

$C = .05 \times .62 \sqrt{2g \times 15.0'}$

$C = .31 \times 19.3$

$C = 6.0$ CFS

$H_{ave} = \frac{H_{max} - 2}{2} = 6.5'$

$T = \frac{\text{Volume}}{\text{Discharge}} = 12,350$ Hours = 514 Days

Assuming no flow into Elm Pond

BY _____ DATE _____

CHKD. BY _____ DATE _____

SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 17 OF 112

PROJECT _____

ELEVATION (MSL)	DEPTH OVER CREST (FT)	DISCHARGE (cfs)	SURFACE AREA	SURCHARGE STORAGE
375.3	0	0	62	0
376.0	.7	27		
376.5	1.2	173		
377.0	1.7	342	70.0	112.2
377.3	2.0	485		
377.7	2.7	1077		
378.2	3.2	1743		
378.7	3.7	2471		
379.0			93.2	375.0

```
A1  BEAR POND DAM HEC1 DB
A2  J  CERAVOLO
A3  MARCH 16, 1981
B    100       0       6       0       0       0       0       0       0       0
B1     5
J      1       1       1
J1     1
K      0       1                                               1
K1  INFLOW HYDROGRAPH TO RESERVOIR
M      0       2      .6                       0
O     60
O1   .03     .03     .03     .03     .02     .03     .02     .04     .03     .03
O1   .03     .04     .03     .03     .04     .04     .05     .05     .05     .05
O1   .05     .07     .07     .07     .10     .11     .14     .16     .26     .55
O1   .91     .35     .23     .17     .12     .10     .09     .08     .07     .06
O1   .06     .05     .05     .05     .04     .05     .04     .04     .04     .04
O1   .03     .03     .03     .03     .03     .03     .03     .02     .03     .02
T                                                       .5      .1
W2           .492
X      0       0       1
K      1       2                                               1
K1  ROUTED FLOW THROUGH RESERVOIR
Y                                       1       1
Y1     1                                                       -1
Y4 975.3     976   976.5     977   977.3     978   978.5     979
Y5     0      87     199     342     485    1079    1743    2471
$A    62    99.2
$E 975.3     980
$$ 975.3
$D   977
K     99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	2
END OF NETWORK	

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	6	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

INFLOW HYDROGRAPH TO RESERVOIR

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	0.60	0.00	0.60	0.00	0.000	0	0	0

PRECIP PATTERN

0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.04	0.03	0.03
0.03	0.04	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.05
0.05	0.07	0.07	0.07	0.10	0.11	0.14	0.16	0.26	0.55
0.91	0.35	0.23	0.17	0.12	0.10	0.09	0.08	0.07	0.06
0.06	0.05	0.05	0.05	0.04	0.05	0.04	0.04	0.04	0.04
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.50	0.10	0.00	0.00

UNIT HYDROGRAPH DATA

SUB-AREA RUNOFF COMPUTATION

PRECIP DATA

NP	STORM	DAJ	DAK
60	0.00	0.00	0.00

TC= 0.00 LAG= 0.49

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 27 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 0.49 VOL= 1.00

48.	146.	305.	460.	530.	527.	463.	376.	267.	194.
144.	108.	79.	59.	44.	32.	24.	18.	13.	10.
7.	5.	4.	3.	2.	1.	0.			

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME			
0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	2.	8.	20.	38.
60.	82.	103.	124.	145.	169.	197.	233.	281.	358.
498.	705.	953.	1165.	1273.	1273.	1183.	1039.	874.	733.
617.	521.	441.	377.	324.	281.	247.	219.	197.	179.
164.	150.	138.	126.	115.	106.	98.	91.	86.	81.
76.	69.	60.	50.	40.	31.	23.	17.	12.	9.
7.	5.	4.	3.	2.	1.	1.	1.	1.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	-1

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME

0 END-OF-PERIOD FLOW

MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	0.06	1	0.03	0.00	0.03	0.	1.01	5.06	51	0.03	0.02	0.01	164.
1.01	0.12	2	0.03	0.00	0.03	0.	1.01	5.12	52	0.03	0.02	0.01	150.
1.01	0.18	3	0.03	0.00	0.03	0.	1.01	5.18	53	0.03	0.02	0.01	138.
1.01	0.24	4	0.03	0.00	0.03	0.	1.01	5.24	54	0.03	0.02	0.01	126.
1.01	0.30	5	0.02	0.00	0.02	0.	1.01	5.30	55	0.03	0.02	0.01	115.
1.01	0.36	6	0.03	0.00	0.03	0.	1.01	5.36	56	0.03	0.02	0.01	106.
1.01	0.42	7	0.02	0.00	0.02	0.	1.01	5.42	57	0.03	0.02	0.01	98.
1.01	0.48	8	0.04	0.00	0.04	0.	1.01	5.48	58	0.02	0.01	0.01	91.
1.01	0.54	9	0.03	0.00	0.03	0.	1.01	5.54	59	0.03	0.02	0.01	86.
1.01	1.00	10	0.03	0.00	0.03	0.	1.01	6.00	60	0.02	0.01	0.01	81.
1.01	1.06	11	0.03	0.00	0.03	0.	1.01	6.06	61	0.00	0.00	0.00	76.
1.01	1.12	12	0.04	0.00	0.04	0.	1.01	6.12	62	0.00	0.00	0.00	69.
1.01	1.18	13	0.03	0.00	0.03	0.	1.01	6.18	63	0.00	0.00	0.00	60.
1.01	1.24	14	0.03	0.00	0.03	0.	1.01	6.24	64	0.00	0.00	0.00	50.
1.01	1.30	15	0.04	0.00	0.04	0.	1.01	6.30	65	0.00	0.00	0.00	40.
1.01	1.36	16	0.04	0.00	0.04	0.	1.01	6.36	66	0.00	0.00	0.00	31.
1.01	1.42	17	0.05	0.04	0.01	2.	1.01	6.42	67	0.00	0.00	0.00	23.
1.01	1.48	18	0.05	0.04	0.01	8.	1.01	6.48	68	0.00	0.00	0.00	17.

LOUIS BERGER & ASSOCIATES INC.

1.01	1.54	19	0.05	0.04	0.01	20.	1.01	6.54	69	0.00	0.00	0.00	12.
1.01	2.00	20	0.05	0.04	0.01	38.	1.01	7.00	70	0.00	0.00	0.00	9.
1.01	2.06	21	0.05	0.04	0.01	60.	1.01	7.06	71	0.00	0.00	0.00	7.
1.01	2.12	22	0.07	0.06	0.01	82.	1.01	7.12	72	0.00	0.00	0.00	5.
1.01	2.18	23	0.07	0.06	0.01	103.	1.01	7.18	73	0.00	0.00	0.00	4.
1.01	2.24	24	0.07	0.06	0.01	124.	1.01	7.24	74	0.00	0.00	0.00	3.
1.01	2.30	25	0.10	0.09	0.01	145.	1.01	7.30	75	0.00	0.00	0.00	2.
1.01	2.36	26	0.11	0.10	0.01	169.	1.01	7.36	76	0.00	0.00	0.00	1.
1.01	2.42	27	0.14	0.13	0.01	197.	1.01	7.42	77	0.00	0.00	0.00	1.
1.01	2.48	28	0.16	0.15	0.01	233.	1.01	7.48	78	0.00	0.00	0.00	1.
1.01	2.54	29	0.26	0.25	0.01	281.	1.01	7.54	79	0.00	0.00	0.00	1.
1.01	3.00	30	0.55	0.54	0.01	358.	1.01	8.00	80	0.00	0.00	0.00	0.
1.01	3.06	31	0.91	0.90	0.01	498.	1.01	8.06	81	0.00	0.00	0.00	0.
1.01	3.12	32	0.35	0.34	0.01	705.	1.01	8.12	82	0.00	0.00	0.00	0.
1.01	3.18	33	0.23	0.22	0.01	953.	1.01	8.18	83	0.00	0.00	0.00	0.
1.01	3.24	34	0.17	0.16	0.01	1165.	1.01	8.24	84	0.00	0.00	0.00	0.
1.01	3.30	35	0.12	0.11	0.01	1273.	1.01	8.30	85	0.00	0.00	0.00	0
1.01	3.36	36	0.10	0.09	0.01	1273.	1.01	8.36	86	0.00	0.00	0.00	0.
1.01	3.42	37	0.09	0.08	0.01	1183.	1.01	8.42	87	0.00	0.00	0.00	0.
1.01	3.48	38	0.08	0.07	0.01	1039.	1.01	8.48	88	0.00	0.00	0.00	0.
1.01	3.54	39	0.07	0.06	0.01	874.	1.01	8.54	89	0.00	0.00	0.00	0.
1.01	4.00	40	0.06	0.05	0.01	733.	1.01	9.00	90	0.00	0.00	0.00	0.
1.01	4.06	41	0.06	0.05	0.01	617.	1.01	9.06	91	0.00	0.00	0.00	0.
1.01	4.12	42	0.05	0.04	0.01	521.	1.01	9.12	92	0.00	0.00	0.00	0.
1.01	4.18	43	0.05	0.04	0.01	441.	1.01	9.18	93	0.00	0.00	0.00	0.
1.01	4.24	44	0.05	0.04	0.01	377.	1.01	9.24	94	0.00	0.00	0.00	0.
1.01	4.30	45	0.04	0.03	0.01	324.	1.01	9.30	95	0.00	0.00	0.00	0.
1.01	4.36	46	0.05	0.04	0.01	281.	1.01	9.36	96	0.00	0.00	0.00	0.
1.01	4.42	47	0.04	0.03	0.01	247.	1.01	9.42	97	0.00	0.00	0.00	0.
1.01	4.48	48	0.04	0.03	0.01	219.	1.01	9.48	98	0.00	0.00	0.00	0.
1.01	4.54	49	0.04	0.03	0.01	197.	1.01	9.54	99	0.00	0.00	0.00	0.
1.01	5.00	50	0.04	0.03	0.01	179.	1.01	10.00	100	0.00	0.00	0.00	0.
									SUM	5.20	4.26	0.94	16486.
										(132.)	(108.)	(24.)	(466.83)

CFS	1273.	275.	165.	165.	16486.
CMS	36.	8.	5.	5.	467.
INCHES		4.26	4.26	4.26	4.26
MM		108.18	108.20	108.20	108.20
AC-FT		136.	136.	136.	136.
THOUS CU M		168.	168.	168.	168.

ROUTED FLOW THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

STAGE	975.30	976.00	976.50	977.00	977.30	978.00	978.50	979.00
FLOW	0.00	87.00	199.00	342.00	485.00	1079.00	1743.00	2471.00
SURFACE AREA=	62.	99.						
CAPACITY=	0.	375.						
ELEVATION=	975.	980.						

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
975.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
977.0	0.0	0.0	0.

STATION 2, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

MO. DA	HR. MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1.01	0.06	1	0.10	0.	0.	0.	975.3
1.01	0.12	2	0.20	0.	0.	0.	975.3
1.01	0.18	3	0.30	0.	0.	0.	975.3
1.01	0.24	4	0.40	0.	0.	0.	975.3
1.01	0.30	5	0.50	0.	0.	0.	975.3
1.01	0.36	6	0.60	0.	0.	0.	975.3
1.01	0.42	7	0.70	0.	0.	0.	975.3
1.01	0.48	8	0.80	0.	0.	0.	975.3
1.01	0.54	9	0.90	0.	0.	0.	975.3
1.01	1.00	10	1.00	0.	0.	0.	975.3
1.01	1.06	11	1.10	0.	0.	0.	975.3
1.01	1.12	12	1.20	0.	0.	0.	975.3
1.01	1.18	13	1.30	0.	0.	0.	975.3
1.01	1.24	14	1.40	0.	0.	0.	975.3
1.01	1.30	15	1.50	0.	0.	0.	975.3
1.01	1.36	16	1.60	0.	0.	0.	975.3
1.01	1.42	17	1.70	2.	0.	0.	975.3
1.01	1.48	18	1.80	8.	0.	0.	975.3
1.01	1.54	19	1.90	20.	0.	0.	975.3
1.01	2.00	20	2.00	38.	1.	0.	975.3
1.01	2.06	21	2.10	60.	2.	1.	975.3
1.01	2.12	22	2.20	82.	3.	1.	975.3
1.01	2.18	23	2.30	103.	4.	2.	975.3
1.01	2.24	24	2.40	124.	6.	3.	975.3
1.01	2.30	25	2.50	145.	8.	4.	975.4
1.01	2.36	26	2.60	169.	10.	5.	975.4
1.01	2.42	27	2.70	197.	13.	7.	975.4
1.01	2.48	28	2.80	233.	16.	8.	975.4
1.01	2.54	29	2.90	281.	20.	10.	975.5
1.01	3.00	30	3.00	358.	25.	13.	975.5

BY LC DATE 3/24/11
CHKD. BY _____ DATE _____
SUBJECT Lake Pond Dam Outlet

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 1 OF 1
PROJECT CC 275

BY ____ DATE 3/84

CHKD. BY ____ DATE ____

SUBJECT ____

LOUIS BERGER & ASSOCIATES INC.

Bear Fork Dam

HEC 1 Data Output

SHEET NO. ___ OF ___

PROJECT ___

1.01	3.06	31	3.10	498.	32.	16.	975.6
1.01	3.12	32	3.20	705.	41.	21.	975.6
1.01	3.18	33	3.30	953.	53.	27.	975.7
1.01	3.24	34	3.40	1165.	69.	35.	975.9
1.01	3.30	35	3.50	1273.	86.	45.	976.0
1.01	3.36	36	3.60	1273.	118.	54.	976.1
1.01	3.42	37	3.70	1163.	147.	63.	976.3
1.01	3.48	38	3.80	1039.	173.	71.	976.4
1.01	3.54	39	3.90	874.	193.	78.	976.5
1.01	4.00	40	4.00	733.	211.	83.	976.5
1.01	4.06	41	4.10	617.	226.	86.	976.6
1.01	4.12	42	4.20	521.	238.	89.	976.6
1.01	4.18	43	4.30	441.	245.	91.	976.7
1.01	4.24	44	4.40	377.	251.	92.	976.7
1.01	4.30	45	4.50	324.	254.	93.	976.7
1.01	4.36	46	4.60	281.	255.	94.	976.7
1.01	4.42	47	4.70	247.	256.	94.	976.7
1.01	4.48	48	4.80	219.	255.	93.	976.7
1.01	4.54	49	4.90	197.	253.	93.	976.7
1.01	5.00	50	5.00	179.	251.	93.	976.7
1.01	5.06	51	5.10	164.	249.	92.	976.7
1.01	5.12	52	5.20	150.	246.	91.	976.7
1.01	5.18	53	5.30	138.	242.	90.	976.7
1.01	5.24	54	5.40	126.	239.	89.	976.6
1.01	5.30	55	5.50	115.	235.	88.	976.6
1.01	5.36	56	5.60	106.	231.	87.	976.6
1.01	5.42	57	5.70	98.	227.	86.	976.6
1.01	5.48	58	5.80	91.	222.	85.	976.6
1.01	5.54	59	5.90	86.	218.	84.	976.6
1.01	6.00	60	6.00	81.	214.	83.	976.6
1.01	6.06	61	6.10	76.	209.	82.	976.5
1.01	6.12	62	6.20	69.	205.	81.	976.5
1.01	6.18	63	6.30	60.	200.	80.	976.5
1.01	6.24	64	6.40	50.	196.	79.	976.5
1.01	6.30	65	6.50	40.	192.	77.	976.5
1.01	6.36	66	6.60	31.	188.	76.	976.5
1.01	6.42	67	6.70	23.	184.	75.	976.4
1.01	6.48	68.	6.80	17.	180.	73.	976.4
1.01	6.54	69	6.90	12.	175.	72.	976.4
1.01	7.00	70	7.00	9.	171.	71.	976.4
1.01	7.06	71	7.10	7.	167.	69.	976.4
1.01	7.12	72	7.20	5.	163.	68.	976.3
1.01	7.18	73	7.30	4.	158.	67.	976.3
1.01	7.24	74	7.40	3.	154.	66.	976.3
1.01	7.30	75	7.50	2.	150.	64.	976.3
1.01	7.36	76	7.60	1.	146.	63.	976.3
1.01	7.42	77	7.70	1.	142.	62.	976.2
1.01	7.48	78	7.80	1.	139.	61.	976.2
1.01	7.54	79	7.90	1.	135.	60.	976.2
1.01	8.00	80	8.00	0.	131.	59.	976.2
1.01	8.06	81	8.10	0.	128.	58.	976.2
1.01	8.12	82	8.20	0.	125.	56.	976.2
1.01	8.18	83	8.30	0.	121.	55.	976.2
1.01	8.24	84	8.40	0.	118.	54.	976.1
1.01	8.30	85	8.50	0.	115.	53.	976.1
1.01	8.36	86	8.60	0.	112.	53.	976.1
1.01	8.42	87	8.70	0.	109.	52.	976.1
1.01	8.48	88	8.80	0.	106.	51.	976.1
1.01	8.54	89	8.90	0.	103.	50.	976.1
1.01	9.00	90	9.00	0.	100.	49.	976.1
1.01	9.06	91	9.10	0.	97.	48.	976.0
1.01	9.12	92	9.20	0.	95.	47.	976.0
1.01	9.18	93	9.30	0.	92.	47.	976.0
1.01	9.24	94	9.40	0.	90.	46.	976.0
1.01	9.30	95	9.50	0.	87.	45.	976.0
1.01	9.36	96	9.60	0.	86.	44.	976.0
1.01	9.42	97	9.70	0.	84.	44.	976.0
1.01	9.48	98	9.80	0.	83.	43.	976.0
1.01	9.54	99	9.90	0.	82.	42.	976.0
1.01	10.00	100	10.00	0.	81.	42.	975.9

BY AC DATE 7/1/

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

Dean Pond Dam

HEC 1 Output Summary

SHEET NO. 1/1 OF ALL

PROJECT CC 516

PEAK OUTFLOW IS	256.	AT TIME	4.70 HOURS			
	CFS	256.	177.	114.	114.	11395.
	CMS	7.	5.	3.	3.	323.
	INCHES		2.75	2.94	2.94	2.94
	MM		69.77	74.79	74.79	74.79
	AC-FT		88.	94.	94.	94.
	THOUS CU M		108.	116.	116.	116.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN RATIO ECONOMIC COMPUTATIONS

FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)

AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 (RATIOS APPLIED TO FLOWS)
				1.00
HYDROGRAPH AT	1	0.60	1	1273.
		(1.55)		(36.05)(
ROUTED TO	2	0.60	1	256.
		(1.55)		(7.24)(

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	975.30	975.30	977.00
STORAGE	0.	0.	116.
OUTFLOW	0.	0.	342.

MAXIMUM RESERVOIR W S ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
976.70	0.00	94.	256.	0.00	4.70	0.00